

Claims

1. A passive access system to enable an authorised user access or entry to a restricted location, area, vehicle, machine or equipment, comprising:
 - 5 a base station;
initiation means to initiate an access communications protocol, the protocol including the transmission by the base station of one or more actuating signals;
one or more transponder means each responsive to the actuating signal to transmit an individual coded response signal;
 - 10 processor means to process the received response signals and to perform a Fourier or other spectral analysis thereon to develop an identification of the individual received response signals; and
the base station selecting one of the identified response signals and authenticating the transponder responsible for the transmission of that selected response
 - 15 signal.
2. A passive access system according to claim 1 wherein the initiation means includes an electrical switch associated with a door handle such that relative movement of the door handle initiates the access communications protocol.
- 20 3. A passive access system according to claim 1 wherein the initiation means includes proximity sensors in or on a vehicle, the proximity sensor sensing the presence of a person adjacent the vehicle.
- 25 4. A passive access system according to claim 1 wherein the initiation means includes proximity sensors in or on a vehicle that senses a person contacting the vehicle.
5. A passive access system according to any one of claims 1 to 4 wherein the
30 actuating signal transmitted by the base station is a low frequency (LF) signal having a field range of between 0.5 and 3 metres.
6. A passive access system according to any one of claims 1 to 5 wherein the
35 individual coded response signal transmitted by each transponder that receives the base station transmitted actuation signal is a unique tone or dual tone multiple frequency

(DTMF) signal or multiple tones, the response signal including an identification code unique to each transponder.

7. A passive access system according to any one of claims 1 to 6 wherein the
5 response signal transmitted by each transponder is received and processed by an RF receiver and demodulator associated with the base station.
8. A passive access system according to claim 7 wherein the demodulated, composite signal is then processed by the base station signal processor which performs
10 a spectral analysis thereon.
9. A passive access system according to claim 8 wherein the spectral analysis is a Fast Fourier Transform (FFT) performed on the time domain signal.
- 15 10. A passive access system according to claim 9 wherein the resulting spectrum computed by the FFT will be a number of tones representative of the number of transponders present in the LF field.
11. A passive access system according to claim 10 wherein on detection of the
20 tones, the base station controller then performs a check to determine which of the transponders has the highest preset priority.
12. A passive access system according to claim 11 wherein the transponder with the highest preset priority is interrogated by the base station for authentication.
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13. A passive access system according to any one of claims 1 to 12 wherein after selecting one of the identified response signals, the base station is tuned to the unique identification signal of the selected transponder for authentication.
- 30 14. A passive access system according to any one of claims 1 to 13 wherein, in the authentication process, a unique authentication code to which only the selected transponder will respond is transmitted by the base station and the coded response is used for access authorisation.
- 35 15. A passive access system according to any one of claims 1 to 14 wherein said authorised user access or entry is to a motor vehicle, and each transponder is associated

with, assigned to or programmed to particular vehicle, and each transponder is assigned a unique identity number, which is associated with a vehicle manufacturer, a key number and a unique tone for the individual vehicle.

- 5 16. A passive access system according to claim 14 wherein each vehicle has a number of associated transponders, the identities of all of which are pre-programmed into the respective vehicle base station, and all of which are unique whereby each transponder associated with each vehicle is uniquely identified.
- 10 17. An access control system to enable an authorised user to gain access or entry to a restricted area, location, vehicle, machine or equipment, and comprising a base station adapted to transmit one or more actuating signals either at predetermined intervals or on the occurrence of a predefined event, one or more transponder means each responsive to the actuating signal to transmit an individual, coded response signal,
15 processor means to process the received response signals and to perform a Fourier transform and/or spectral analysis on the response signal to develop an identification of separate, individual received response signals, the base station selecting one of the identified response signals and authenticating the transponder responsible for the transmission of that selected response signal.
- 20 18. A passive access system according to claim 17 wherein said predefined event comprises actuation of an electrical switch associated with a door handle such that relative movement of the door handle initiates the transmission of the actuating signal.
- 25 19. A passive access system according to claim 17 wherein said predefined event comprises actuation of proximity sensors in or on a vehicle, the proximity sensor sensing the presence of a person adjacent the vehicle and initiating the transmission of the actuating signal.
- 30 20. A passive access system according to claim 17 wherein said predefined event comprises actuation of proximity sensors in or on a vehicle, the proximity sensor sensing a person contacting the vehicle and initiating the transmission of the actuating signal.

21. A passive access system according to any one of claims 17 to 20 wherein the actuating signal transmitted by the base station is a low frequency (LF) signal having a field range of between 0.5 and 3 metres.
- 5 22. A passive access system according to any one of claims 17 to 21 wherein the individual coded response signal transmitted by each transponder that receives the base station transmitted actuation signal is a unique tone or dual tone multiple frequency (DTMF) signal or multiple tones, the response signal including an identification code unique to each transponder.
- 10 23. A passive access system according to any one of claims 17 to 22 wherein the response signal transmitted by each transponder is received and processed by an RF receiver and demodulator associated with the base station.
- 15 24. A passive access system according to claim 23 wherein the demodulated, composite signal is then processed by the base station signal processor which performs a spectral analysis thereon.
- 20 25. A passive access system according to claim 24 wherein the spectral analysis is a Fast Fourier Transform (FFT) performed on the time domain signal.
- 25 26. A passive access system according to claim 25 wherein the resulting spectrum computed by the FFT will be a number of tones representative of the number of transponders present in the LF field.
27. A passive access system according to claim 26 wherein on detection of the tones, the base station controller then performs a check to determine which of the transponders has the highest preset priority.
- 30 28. A passive access system according to claim 27 wherein the transponder with the highest preset priority is interrogated by the base station for authentication.
29. A passive access system according to any one of claims 17 to 28 wherein after selecting one of the identified response signals, the base station is tuned to the unique
35 identification signal of the selected transponder for authentication.

30. A passive access system according to any one of claims 17 to 29 wherein, in the authentication process, a unique authentication code to which only the selected transponder will respond is transmitted by the base station and the coded response is used for access authorisation.

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31. A passive access system according to any one of claims 17 to 30 wherein said authorised user access or entry is to a motor vehicle, and each transponder is associated with, assigned to or programmed to particular vehicle, and each transponder is assigned a unique identity number, which is associated with a vehicle manufacturer, a key
10 number and a unique tone for the individual vehicle.

32. A passive access system according to claim 31 wherein each vehicle has a number of associated transponders, the identities of all of which are pre-programmed into the respective vehicle base station, and all of which are unique whereby each
15 transponder associated with each vehicle is uniquely identified.

33. A passive access system according to claim 17 wherein said actuating signal is transmitted at predetermined intervals.

20 34. A passive access system according to claim 17 wherein the analysis carried out on the received response signals separates the individual spectral components of the signals into separate, identifiable signals representative of individual transponder response signals.

25 35. A passive access system substantially as hereinbefore described with reference to the accompanying drawings.